

**What is claimed is:**

1. A silicon dual inertial sensors, including both functions of a rotation rate sensor and an acceleration sensor, whose structure is made of a (110) silicon chip with bulk-micromachining method, and is in a form of parallelogram, wherein said structure is further comprising an outer frame, including a first and a second inner frame, a central anchor and a plurality of connecting blocks; each inner frame comprises a proof mass, which is connected to said inner frame with a plurality of sensing resilient beams, and said inner frame is connected to said outer frame with a plurality of driving resilient beams, or connected to two common connection beams which are positioned at both sides of the proof masses and then connected to said central anchor with the common resilient beam; said structure also comprises two sheets on the front side and back side of said silicon chip, and said sheets are connected to said outer frame, said central anchor and said connecting blocks; wherein said sensing beams make it easier for said proof-masses to move perpendicular to the surface of said silicon chip (defined as z-axis), and said driving beams make it easier for said inner frames to move in parallel with the surface of said silicon chip (defined as y-axis); the sides of said inner frames which are perpendicular to the y-axis are driver body, whose surface comprises a plurality of long trenches or slits perpendicular to the y-axis; the surface of each said sheet corresponding to each said driver body comprises two sets of stripe electrodes which are interposed to each other and in parallel to said long trenches or slits, and thereof being formed two sets of driving capacitors with the corresponding surface of the driver body; the surface of each said sheet corresponding to each said proof-mass is electroplated with a metal thin film electrode, which form sensing capacitor with the surface of said proof-mass; when an oscillating signal with proper phase imposed on each said driving capacitors will generate an electrostatic force to make said first inner frame and said second inner frame to move in opposite direction along the y-axis, and also move proof-mass in the opposite direction along the y-axis, if there is a rotation rate  $\Omega$  along the x-axis, it will generates a Coriolis force to make said proof-masses to move in the opposite direction of the z-axis; if an acceleration is input along the z-axis, the specific force will move said proof-masses with the same direction; when said

proof-masses move or oscillate, the capacitance of the sensing capacitor will change due to the change of the capacitor's distance; hence the moving distance can be obtained by measuring the change of capacitance; as the rotation rate outputs an alternating signal, and acceleration outputs a direct signal, they can be separated with signal processing.

2. A silicon dual inertial sensors as in Claim 1, wherein the front and back surfaces of said proof-masses comprise a plurality of bumps or long convex and its insulation layer to prevent stickiness problem between said proof-mass and said glass sheets.
3. A silicon dual inertial sensors as in Claim 1, wherein the front and back surfaces of said proof-masses comprise a plurality of long concave or slits parallel to any side of said proof-mass to reduce the air resistance when said proof-mass vibrate along the z-axis.
4. A silicon dual inertial sensors as in Claim 1, wherein the surfaces of said outer frame, said connecting block or said anchor comprise at least a concave, whose corresponding glass sheet is electroplated with a metal thin film electrode, to form a temperature sensing capacitor; because its location is not affected by inertial force, and its capacitance is only affected by temperature, said capacitor can be used to compensate the effect of temperature on said dual inertial sensors.
5. A silicon dual inertial sensors as in Claim 2, wherein the front and back surfaces of said proof-mass comprise a plurality of long concave or slits parallel to any side of said proof-mass to reduce the air resistance when said proof-mass vibrate along the z-axis.
6. A silicon dual inertial sensors as in Claim 2, wherein the surfaces of said outer frame, said connecting block or said anchor comprise at least a concave, whose corresponding glass sheet is electroplated with a metal thin film electrode, to form a temperature sensing capacitor; because its location is not affected by inertial force, and its capacitance is only affected by temperature, said capacitor can be used to compensate the effect of temperature on said dual inertial sensors.
7. A silicon dual inertial sensors as in Claim 3, wherein the surfaces of said outer frame, said connecting block or said anchor comprise at least a concave, whose corresponding glass sheet is electroplated with a metal thin film electrode, to form a temperature sensing capacitor; because its location is not affected by inertial

force, and its capacitance is only affected by temperature, said capacitor can be used to compensate the effect of temperature on said dual inertial sensors.

8. A silicon dual inertial sensors as in Claim 1, wherein the front and back surfaces of said proof-mass comprise a plurality of bumps or long convex and its insulation layer to prevent stickiness problem between said proof-mass and said glass sheets; the front and back surfaces of said proof-mass comprise a plurality of long concave or slits parallel to any side of said proof-mass to reduce the air resistance when said proof-mass vibrate along the z-axis; and the surfaces of said outer frame, said connecting block or said anchor comprise at least a concave, whose corresponding glass sheet is electroplated with a metal thin film electrode, to form a temperature sensing capacitor; because its location is not affected by inertial force, and its capacitance is only affected by temperature, said capacitor can be used to compensate the effect of temperature on said dual inertial sensors.
9. A silicon dual inertial sensor as in Claim 1, wherein the surface of each said sheet corresponding to each said proof-mass comprises a metal thin film sensing electrode and a metal thin film electrode for gyroscope feedback driver.
10. A silicon dual inertial sensors, including both functions of a rotation rate sensor and an acceleration sensor, whose structure is made of a conductive material, wherein said structure is further comprising an outer frame, including at least an accelerometer, an anchor and a plurality of connecting blocks; each accelerometer comprises an inner frame and an proof mass, which is connected to said inner frame with a plurality of sensing resilient beams, and said inner frame is connected to said outer frame with a plurality of driving resilient beams, or connected to two common connection beams, which are positioned at both sides of the proof masses and then connected to said central anchor with the common resilient beam ; said structure also comprises two sheets on the front side and back side of said silicon chip, and said sheets are connected to said outer frame, said anchors and said connecting blocks; wherein said sensing beam makes it easier for said proof-mass to move perpendicular to the surface of said silicon chip (defined as z-axis), and said driving beams makes it easier for said inner frame to move in parallel with the surface of said silicon chip (defined as y-axis); the sides of said inner frame which are perpendicular to the y-axis are driver body, whose surface comprises a plurality of long concave or slits perpendicular to the y-axis; the surface of each said sheet corresponding to each said driver body comprises

two sets of stripe electrodes which are interposed to each other and in parallel to said long trenches or slits, and thereof being formed two sets of driving capacitors with the corresponding surface of the driver body; when an oscillating signal with proper phase imposed on each said driving capacitors will generate a electrostatic force to make said first inner frame and said second inner frame to move in opposite direction along the y-axis, and also move proof-masses in the opposite direction along the y-axis, if there is a rotation rate  $\Omega$  along the x-axis, it will generates a Coriolis force to make said proof-masses to move in the opposite direction of the z-axis; if an acceleration is input along the z-axis, the specific force will move said proof-masses with the same direction; when said proof-mass move or oscillate, the said accelerometers output signals; as the rotation rate outputs an alternating signal, and acceleration outputs a direct signal, they can be separated with signal processing.

11. A silicon dual inertial sensors as in Claim 10, wherein said structure is made of a (110) silicon chip with bulk-micromachining methods, and which is in a shape of a parallelogram.
12. A silicon dual inertial sensors as in Claim 10, wherein the front and back surfaces of said proof-mass comprise a plurality of bumps or long convex and its insulation layer to prevent stickiness problem between said proof-mass and said glass sheets.
13. A silicon dual inertial sensors as in Claim 10, wherein the front and back surfaces of said proof-mass comprise a plurality of long concave or slits parallel to any side of said proof-mass to reduce the air resistance when said proof-mass vibrate along the z-axis.
14. A silicon dual inertial sensors as in Claim 10, wherein the surfaces of said outer frame, said connecting block or said anchor comprise at least a temperature sensor; because its location is not affected by inertial force, and its output is only affected by temperature, said temperature sensor can be used to compensate the effect of temperature on said dual inertial sensors.
15. A silicon dual inertial sensors as in Claim 12, wherein the front and back surfaces of said proof-mass comprise a plurality of long concave or slits parallel to any side of said proof-mass to reduce the air resistance when said proof-mass vibrate along the z-axis.

16. A silicon dual inertial sensors as in Claim 12, wherein the surfaces of said outer frame, said connecting block or said anchor comprise at least a temperature sensor; because its location is not affected by inertial force, and its output is only affected by temperature, said temperature sensor can be used to compensate the effect of temperature on said dual inertial sensors.
17. A silicon dual inertial sensors as in Claim 13, wherein the surfaces of said outer frame, said connecting block or said anchor comprise at least a concave, whose corresponding glass sheet is electroplated with a metal thin film electrode, to form a temperature sensing capacitor; because its location is not affected by inertial force, and its capacitance is only affected by temperature, said capacitor can be used to compensate the effect of temperature on said dual inertial sensors.
18. A silicon dual inertial sensors as in Claim 10, wherein the front and back surfaces of said proof-mass comprise a plurality of bumps or long convex and its insulation layer to prevent stickiness problem between said proof-mass and said glass sheets; the front and back surfaces of said proof-mass comprise a plurality of long concave or slits parallel to any side of said proof-mass to reduce the air resistance when said proof-mass vibrate along the z-axis; and the surfaces of said outer frame, said connecting block or said anchor comprise at least a concave, whose corresponding glass sheet is electroplated with a metal thin film electrode, to form a temperature sensing capacitor; because its location is not affected by inertial force, and its capacitance is only affected by temperature, said capacitor can be used to compensate the effect of temperature on said dual inertial sensors.